

153518

EE/CA and RI/FS Support Sampling Plan

Sauget Area 1

Sauget and Cahokia, Illinois

Volume 1D

Engineering Evaluation/Cost Analysis Work Plan

June 25, 1999

Submitted To:

**U.S. Environmental Protection Agency
Chicago, Illinois**

Submitted By:

**Solutia Inc.
St. Louis, Missouri**

**ENGINEERING EVALUATION/COST ANALYSIS
WORK PLAN
SAUGET AREA 1 SITE
SAUGET AND CAHOKIA, ILLINOIS**

June 25, 1999

Prepared for:

Solutia Inc.
10300 Olive Boulevard
St. Louis, Missouri 63141

Prepared by:

ROUX ASSOCIATES, INC.
1110 NASA Road One, Suite 207
Houston, Texas 77058
(281) 335-4000

CONTENTS

1.0	INTRODUCTION-----	1
1.1	Objectives -----	2
1.2	Organization of Workplan-----	3
2.0	SITE CHARACTERIZATION -----	5
2.1	Site Description and Background-----	5
2.2	Previous Removal Actions-----	6
2.3	Source, Nature, and Extent of Contamination-----	6
2.4	Analytical Data -----	6
2.5	Streamlined Risk Evaluation -----	6
2.6	Ecological Risk Assessment-----	7
3.0	IDENTIFICATION OF REMOVAL ACTION SCOPE, GOALS, AND OBJECTIVES -----	9
3.1	Determination of Removal Scope-----	10
3.2	Determination of Removal Schedule-----	10
4.0	IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES-----	11
4.1	Effectiveness -----	14
4.1.1	Overall Protection of Human Health and the Environment-----	14
4.1.2	Compliance with ARARs and other Criteria, Advisories and Guidelines -----	14
4.1.3	Long-Term Effectiveness and Permanence-----	15
4.1.4	Reduction of Toxicity, Mobility, or Volume Through Treatment-----	15
4.1.5	Short-Term Effectiveness-----	15

**Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois**

4.2	Implementability -----	16
4.2.1	Technical Feasibility -----	16
4.2.2	Administrative Feasibility -----	17
4.2.3	Availability of Services and Materials -----	17
4.3	Cost-----	17
5.0	COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES ----	19
6.0	DRAFT EE/CA REPORT SUBMISSION -----	20
7.0	FINAL EE/CA REPORT -----	22
8.0	SCHEDULE OF EE/CA SUBMISSION -----	23

TABLES

1.	Removal Alternatives Criteria-----	13
	References-----	25

1.0 INTRODUCTION

On January 21, 1999, Monsanto Company and Solutia Inc. (Respondents) entered into an Administrative Order by Consent (AOC) with Region V of the United States Environmental Protection Agency (USEPA) with regards to the matter of environmental efforts to be completed at the Sauget Area 1 Site in Sauget and Cahokia, Illinois (Site). The Site is identified as six (6) source areas near, or adjacent to, Dead Creek known as Sites I, H, G, L, M and N. Also included in the Site are six (6) segments of Dead Creek sediments (CS) identified as CS-A through CS-F.

One of the requirements of the AOC, identified in Section V, is to prepare and implement an Engineering Evaluation/Cost Analysis (EE/CA) at the Site. The main purpose of the EE/CA is to evaluate removal options for soil, sediments, surface water, air, and leachate (ground-water seepage at an elevation greater than the uppermost water-bearing zone) that may pose a threat to human health and the environment. In addition, the AOC requires that a Remedial Investigation/Feasibility Study (RI/FS) be performed simultaneously with the EE/CA to address ground-water at the Sauget Area 1 Site. These two investigations will be performed concurrently and are two key components of an overall effort to address impacted media at the Sauget Area 1 Site.

Pursuant to §300.415(b)(4)(i) of the National Contingency Plan (NCP), an EE/CA must be completed at all sites where non-time critical removal actions are required. The goals of the EE/CA are to identify the objectives of the removal action and to analyze the various alternatives that may be used to satisfy these objectives for cost, effectiveness, and implementability. Other goals of the EE/CA are to:

- Satisfy environmental review requirements for removal actions;
- Satisfy administrative record requirements for improved documentation of removal action selection; and
- Provide a framework for evaluating and selecting alternative technologies.

Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois

This EE/CA Work Plan is consistent with the requirements of the AOC and the Scope of Work (SOW). Furthermore, the USEPA document titled *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA/540-R-93-057) was used as a guidance document during preparation of the Work Plan as required by the AOC. This EE/CA Work Plan was developed through a four-step process including:

- A detailed review of historical background information;
- Review of the AOC and attached SOW;
- Review of the above-referenced guidance document; and
- The identification of information and data needs.

The USEPA is responsible for satisfying community relations requirements relating to the EE/CA. At the conclusion of the EE/CA, the USEPA will be responsible for the selection of a removal action(s) for the media specified above, and will document the selection(s) in an Action Memorandum.

1.1 Objectives

The overall objective of the EE/CA process is to gather information from previous and current investigations, evaluate media in the areas of concern, and provide evaluations and comparisons that are sufficient to support an informed risk management decision regarding removal selection. The EE/CA will be based on site characterization information and data that will be collected as part of the field activities defined in the Support Sampling Plan (SSP).

The objectives of the EE/CA are to develop, screen, and to perform a detailed evaluation of removal alternatives for media in areas that are determined to be acutely hazardous to human health and the environment. The purpose of removal actions generally is to respond to a release or threat of a release of hazardous substances so as to prevent, minimize or mitigate harm to human health and the environment. As cited in the preamble to the NCP (FR 8695):

**Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois**

"Although all removals must be protective of human health and the environment within their defined objectives, removals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively address all threats at a site".

USEPA Region V intends to address all threats to human health and the environment (with the exception of ground water) at the Sauget Area I site using the EE/CA process.

The removal objectives will be consistent with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable considering the urgency of the situation and scope of the removal.

The final objective of the EE/CA involves analyzing each selected removal alternative for effectiveness, implementability, and cost.

1.2 Organization of Work Plan

The organization of this Work Plan is as follows:

- Section 1.0: Introduction
- Section 2.0: Site Characterization
- Section 3.0: Identification of Removal Action Scope, Goals, and Objectives
- Section 4.0: Identification and Analysis of Removal Action Alternatives
- Section 5.0: Comparative Analysis of Removal Action Alternatives
- Section 6.0: Draft EE/CA Report Submission
- Section 7.0: Final EE/CA Report
- Section 8.0: Schedule

Section 1.0 discusses relevant background and regulatory information pertaining to the EE/CA, project objectives, and organization of the Work Plan. Section 2.0 discusses the proposed data collection tasks required to characterize the site, such as sampling, data collection and validation, and risk assessment. Section 3.0 discusses the potential scope,

Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois

goals, and objectives of removal actions. Section 4.0 describes the process of selecting removal alternatives. Section 5.0 presents the criteria for comparing removal alternatives. Sections 6.0 and 7.0 discuss preparation of the Draft and Final EE/CA Reports, and Section 8.0 presents the EE/CA submission schedule.

2.0 SITE CHARACTERIZATION

The initial task involved in implementation of an EE/CA is to characterize the site and surrounding area with data and information which have been previously collected. The EE/CA will summarize available data on the physical, demographic, and other characteristics of the Site and surrounding areas. The Site characterization discussion will concentrate on those characteristics necessary to evaluate and select an appropriate removal action. Data to be collected for the EE/CA and incorporated into this section will come from the SSP and RI, and past investigations. The Site characterization will be broken down into the following sub-sections:

- Site Description and Background
- Previous Removal Actions
- Source, Nature, and Extent of Contamination
- Analytical Data
- Streamlined Risk Evaluation
- Ecological Risk Assessment

A discussion of each of these sub-sections is provided below.

2.1 Site Description and Background

This section will include current and historical information pertaining to the Site. The following types of information will be included, where available and as appropriate, to define the Site-specific conditions and the scope of the removal action:

- Site location and physical setting;
- Present and past facility operations and disposal practices (including incidents of fire and explosions);
- Geology/hydrology/hydraulics;
- Surrounding land use and populations;
- Sensitive ecosystems; and
- Meteorology/Climatology;

2.2 Previous Removal Actions

This section of the EE/CA will describe the previous removal actions at the Site. Previous information, if relevant, shall be organized as follows:

- The scope and objectives of the previous removal action(s);
- The amount of time spent on the previous removal action(s);
- The nature and extent of hazardous substances, pollutants, or contaminants treated or controlled during the previous removal action(s) (including all monitoring conducted); and
- The technologies used and/or treatment levels used for the previous removal action(s).

2.3 Source, Nature and Extent of Contamination

This section will summarize the available site characterization data for the Site, including the locations of the hazardous substances, pollutants, or contaminants; the quantity, volume, size or magnitude of the impacts; and the physical and chemical attributes of the hazardous pollutants or contaminants.

2.4 Analytical Data

The Analytical Data Section will present all quantifiable data collected for the EE/CA. This section will summarize existing data and include the additional data to be collected in accordance with the Support Sampling Plan. The data will include, soil, surface water, sediments, and air impact information.

2.5 Streamlined Risk Evaluation

In accordance with USEPA EE/CA guidance, a streamlined risk evaluation is a new type of evaluation, intermediate in scope between the limited risk evaluation undertaken for emergency removal actions and the conventional baseline assessment normally conducted for remedial actions. This evaluation will focus on actual and potential risks to the surrounding residential and industrial worker population from exposure to contaminated soils, sediments, surface water, air, and ingestion of potentially impacted

biota in surrounding ecosystems. Reasonable maximum estimates of exposure and most likely estimates of exposure will be defined for both current land use conditions and reasonable future land use conditions. In general, this evaluation will use sampling data from the Site to identify the chemicals of concern, provide an estimate of how and to what extent people might be exposed to these chemicals, and provide an assessment of the health effects associated with these chemicals. The Streamlined Risk Evaluation for this study will focus on the specific areas that the removal action is intended to address. The evaluation will project the potential risk of health problems occurring if no cleanup action is taken at the Site and establish target action levels for both carcinogenic and non-carcinogenic constituents of concern (COCs). The risk evaluation will be conducted in general conformance with relevant aspects of the *Risk Assessment Guidance for Superfund (RAGS)* (EPA/540/1-89/002, December 1989).

A Human Health Risk Assessment Work Plan is included with this submittal (Volume 1B) that outlines the relevant requirements of the SOW and AOC and provides details that will be included in the Risk Assessment Report. The streamlined risk will be conducted by ENSR concurrent with the preparation of the EE/CA. The findings from the streamlined risk evaluation will be incorporated into the EE/CA written submittal and will be used in the overall evaluation of removal alternatives.

2.6 Ecological Risk Assessment

In accordance with the SOW and AOC, the EE/CA will include an ecological risk assessment. The risk assessment will be consistent with the USEPA guidance document: *Ecological Risk Assessment Guidance for Superfund. Process for Designing and Conducting Ecological Risk Assessments* (EPA/540/R/97/006, June 1997). Furthermore, the ecological risk assessment will contain the following information as required in the SOW:

- Hazard Identification (sources);
- Dose-Response Assessment;
- Conceptual Exposure/Pathway Analysis;

Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois

- Characterization of Site and Potential Receptors;
- Select Chemical, Indicator Species, and End Points;
- Exposure Assessment;
- Toxicity Assessment/Ecological Effects Assessment;
- Risk Characterization; and
- Identification of Limitations/Uncertainties.

An Ecological Risk Assessment Work Plan is included with this submittal (Volume 1C) that outlines the relevant requirements of the SOW and AOC, and provides details that will be included in the Ecological Risk Assessment Report. The ecological risk assessment will be conducted by Menzie-Cura & Associates, Inc. concurrent with the development of the EE/CA. The findings from the ecological risk assessment will be incorporated into the EE/CA written submittal.

3.0 IDENTIFICATION OF REMOVAL ACTION SCOPE, GOALS, AND OBJECTIVES

Identifying the scope, goals, and objectives for a removal action is a critical step in the EE/CA and in the conduct of non-time-critical removal actions. These objectives will meet specified cleanup levels while working within the statutory limits, and attaining ARARs to the extent practicable. Pursuant to the SOW, the following factors will be taken into consideration when determining the removal scope, goals, and objectives.

- Prevention or abatement of actual or potential exposure to nearby human populations, (including workers), animals, or the food chain from hazardous substances, pollutants, or contaminants;
- Prevention or abatement of actual or potential contamination of drinking water supplies and ecosystems;
- Stabilization or elimination of hazardous substances in drums, barrels, tanks, or other bulk storage containers that may pose a threat or release;
- Treatment or elimination of high levels of hazardous substances, pollutants, or contaminants in soils or sediments largely at or near the surface that may migrate;
- Elimination of threat of fire or explosion;
- Acceptable chemical-specific contaminant levels, or range of levels, for all exposure routes; and
- Mitigation or abatement of other situations or factors that may pose threats to public health, welfare, or the environment.

3.1 Determination of Removal Scope

The EE/CA will support the determination of the appropriate scope of the removal action by defining the broad scope and specific objectives and addressing the protectiveness of the removal action. The scope of the action could be, for example, site stabilization, source mitigation, or surface cleanup or "hot spot" removal of hazardous substances. The main emphasis will be on addressing media (except ground water) in all areas where acute and long-term chronic threats to human health and the environment are present.

3.2 Determination of Removal Schedule

A general schedule for any proposed removal activities will be developed, including both the start and completion time for the removal action, as required by the SOW.

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Based on the analysis of the nature and extent of contamination and on the cleanup objectives that may be developed, as described in the previous section, a limited number of alternatives appropriate for addressing the removal action objectives will be identified and addressed. Whenever practicable, the alternatives will also consider the CERCLA preference for treatment over conventional containment or land disposal approaches.

Based on the available information, only the most qualified technologies that apply to the media or source of contamination will be discussed in the EE/CA. The use of presumptive remedy guidance, as appropriate and applicable to any of the disposal areas of the Sauget Area 1 Site, will also provide an immediate focus for the identification and analysis of alternatives. The guidance includes, but is not limited to: *Implementing Presumptive Remedies* (EPA 540-R-97-029, October 1997). Presumptive remedies involve the use of remedial technologies that have been consistently selected at similar sites or for similar contamination.

A limited number of alternatives, including any identified presumptive remedies, will be selected for detailed analysis. Each of the alternatives shall be described with enough detail so that the entire treatment process can be understood. Technologies that may apply to the media or source of contamination shall be listed in the EE/CA.

A preliminary list of alternatives that may be relevant for the Sauget Area 1 Site consists of, but is not limited to, treatment technologies, removal and off-site treatment/disposal, removal and an on-site treatment/disposal, and in-place containment of soils, sediments, and wastes. As part of any future remediation/removal activities in Dead Creek, alternatives will be evaluated that will prevent future flooding of residential/commercial areas within the Site area. A "no action" alternative will not be included for evaluation in the EE/CA in accordance with the SOW.

Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois

Removal action alternatives will be analyzed against three broad criteria: effectiveness, implementability, and cost. This analysis consists of analyzing each of the identified alternatives against the criteria, and subsequently determining if the alternative satisfies the removal action objectives that were previously identified. The three broad categories can be broken down into the subcategories as shown on Table 1 (Removal Alternatives Criteria) provided below. Table 1 was taken directly from the USEPA Guidance on Conducting Non-time Critical Removal Actions Under CERCLA (Exhibit 7, Objectives/Criteria to be Used in Comparative Analysis of Alternatives). These criteria are discussed below.

TABLE 1
REMOVAL ALTERNATIVES CRITERIA

☐ **EFFECTIVENESS**

<input type="checkbox"/>	Protectiveness
<input type="checkbox"/>	Protection of public health and community
<input type="checkbox"/>	Protection of workers during implementation
<input type="checkbox"/>	Protection of the environment
<input type="checkbox"/>	Compliance with ARARs
<input type="checkbox"/>	Ability to Achieve Removal Objectives
<input type="checkbox"/>	Level of treatment/containment expected
<input type="checkbox"/>	No residual effect concerns
<input type="checkbox"/>	Will maintain control until long-term solution implemented

☐ **IMPLEMENTATIBILITY**

<input type="checkbox"/>	Technical Feasibility
<input type="checkbox"/>	Construction and operation considerations
<input type="checkbox"/>	Demonstrated performance/useful life
<input type="checkbox"/>	Adaptable to environmental conditions
<input type="checkbox"/>	Contributes to remedial performance
<input type="checkbox"/>	Can be implemented within 1 year
<input type="checkbox"/>	Availability
<input type="checkbox"/>	Equipment
<input type="checkbox"/>	Personnel and services
<input type="checkbox"/>	Outside laboratory testing capacity
<input type="checkbox"/>	Off-site treatment and disposal; capacity
<input type="checkbox"/>	Post Removal Site Control (PRSC)
<input type="checkbox"/>	Administrative Feasibility
<input type="checkbox"/>	Permits required
<input type="checkbox"/>	Easements of right-of-ways required
<input type="checkbox"/>	Impacts on adjoining property
<input type="checkbox"/>	Ability to impose institutional controls
<input type="checkbox"/>	Likelihood of obtaining an exemption from limits

☐ **COST**

<input type="checkbox"/>	Capital Cost
<input type="checkbox"/>	Post Removal Site Control (PRSC) costs
<input type="checkbox"/>	Present Worth Cost

4.1 Effectiveness

The effectiveness of an alternative refers to its ability to meet the objective within the scope of the removal action. This Section of the EE/CA will evaluate each alternative against the scope of the removal action and against each specified objective for disposition of the wastes and the level of cleanup desired. These objectives will be discussed in terms of protectiveness of public health and the environment from short-term or acute threats and from chronic or long-term threats.

4.1.1 Overall Protection of Public Health and the Environment

The effectiveness of each alternative in protecting human health and the environment will be discussed in a consistent manner. Assessments conducted under other evaluation criteria, including long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs, where practicable, will be included in the discussion. The discussion will also focus on how each alternative achieves adequate protection and describe how the alternative will reduce, control, or eliminate risks at the Site through the use of treatment, engineering, or institutional controls. This evaluation will also identify any unacceptable short-term impacts.

4.1.2 Compliance with ARARs and Other Criteria, Advisories, and Guidance

Section 300.415(i) of the NCP requires that removal actions pursuant to CERCLA Section 106 attain ARARs under federal or State environmental laws or facility siting laws, to the extent practicable considering the urgency of the situation and the scope of the removal.

The detailed analysis shall summarize which requirements are applicable or relevant and appropriate to an alternative and describe how the alternative meets those requirements. A summary table may be employed to list potential ARARs. In addition to ARARs, other Federal or State advisories, criteria, or guidance to be considered (TBC) may be identified.

4.1.3 Long-Term Effectiveness and Permanence

This evaluation assesses the extent and effectiveness of the controls that may be required to manage risk posed by treatment residuals and/or untreated wastes at the Site. The following components will be considered for each alternative: Magnitude of risk, and adequacy and reliability of controls.

4.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

As required by the USEPA, an evaluation based upon the following subfactors will be performed for each alternative:

- The treatment process(es) employed and the material(s) it will treat;
- The amount of the hazardous materials to be destroyed or treated;
- The degree of reduction expected in toxicity, mobility, or volume;
- The degree to which treatment will be irreversible;
- The type and quantity of residuals that will remain after treatment; and
- Whether the alternative will satisfy the preference for treatment.

4.1.5 Short Term Effectiveness

The short-term effectiveness criterion will address the effects of the alternative during implementation before the removal objectives have been met. Alternatives will also be evaluated with respect to their effects on human health and the environment following implementation. The following factors will be addressed, as appropriate, for each alternative:

- Protection of the Community – This factor will address any risk to the affected community that may result from implementation of the proposed action, whether from air quality impacts, fugitive dusts, transportation of hazardous materials, or other sources.
- Protection of the Workers – This factor will assess any threats to site workers and the effectiveness and reliability of protective measures that would be taken.

- Environmental Impacts – This factor evaluates the potential adverse environmental impacts from the implementation of each alternative. The factor also assesses the reliability of mitigation measures in preventing or reducing the potential impacts.
- Time Until Response Objectives Are Achieved – This factor estimates the time needed to achieve protection for the Site itself or for individual elements or threats associated with the Site.

4.2 Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. The following factors will be considered under this criterion.

4.2.1 Technical Feasibility

The EE/CA will assess the ability of the technology to implement the remedy. The following factors will be described:

- The degree of difficulty in constructing and operating the technology;
- The reliability of the technology;
- The availability of necessary services and materials;
- The scheduling aspects of implementing the alternatives during and after implementation;
- The potential impacts to the local community during construction operations; and
- The environmental conditions with respect to set-up and construction and operation

Potential future remedial and/or removal actions, as well as the ability to monitor the effectiveness of the alternatives, will also be discussed.

- The potential impacts to the local community during construction operations; and
- The environmental conditions with respect to set-up and construction and operation.

Potential future remedial and/or removal actions, as well as the ability to monitor the effectiveness of the alternatives, will also be discussed.

4.2.2 Administrative Feasibility

The administrative feasibility factor evaluates those activities needed to coordinate with other offices and agencies. The administrative feasibility of each alternative will be evaluated, including the need for off-site permits, adherence to applicable non-environmental laws, and concerns of other regulatory agencies. Factors that will be considered include, but are not limited to, the following: statutory limits, permits, and waivers.

4.2.3 Availability of Services and Materials

The EE/CA will determine if off-site treatment, storage, and disposal capacity, equipment, personnel, services and materials, and other resources necessary to implement an alternative will be available in time to maintain the removal schedule. Several important availability factors are:

- Personnel and technology;
- Off-site treatment, storage, and disposal;
- Services and materials; and
- Prospective technologies.

4.3 Cost

Each alternative will be evaluated to determine its projected costs. The evaluation will compare each alternative's capital and operation and maintenance costs. The present worth of alternatives will be calculated. The following items will be presented:

Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois

- Direct Capital Costs – Costs for construction, materials, land, transportation, analysis of samples, and treatment.
- Indirect Capital Costs – Costs for design, legal fees, and permits.
- Long-Term Operation and Maintenance Costs – Costs for maintenance and long-term monitoring.

5.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

After the potential removal action alternatives have been described and individually assessed against the evaluation criteria described previously, a comparative analysis will be conducted to evaluate the relative performance of each alternative in relation to each of the criteria. The purpose of this analysis will be to identify advantages and disadvantages of each alternative relatively, allowing for direct comparisons. The alternatives will also be compared against the removal action objectives.

6.0 DRAFT EE/CA REPORT SUBMISSION

At the conclusion of the field activities and individual studies that are described above, a comprehensive Draft EE/CA written report will be prepared and submitted to the USEPA and Illinois EPA. The EE/CA Report will include an Executive Summary which will provide a general overview of the contents of the EE/CA including a brief discussion of the Site and the current or potential threat(s) posed by Site conditions. The Executive Summary will also identify the scope and objectives of the removal action(s), as well as the removal action alternatives. Finally, this section of the EE/CA will provide information on the recommended removal action alternative.

This EE/CA document will also include details and results from the Support Sampling activities and the treatability studies, the Streamlined Risk Evaluation, and Ecological Risk Assessment. This document will discuss the removal action objectives and identification of the removal action alternatives. Finally, the selected removal action alternatives will be evaluated and compared based upon information and objectives that were developed during this study. Recommendations for the final selected removal alternative will be included in the Draft EE/CA document. The written Draft EE/CA document will have the following format:

1.0 Executive Summary

2.0 Site Characterization

2.1 Site Description and Background

2.1.1 Site Location and Physical Setting

2.1.2 Present and Past Facility Operations and Disposal Practices (including incidents of fire and explosions)

2.1.3 Geology/Hydrology/Hydraulics

2.1.4 Surrounding Land Use and Population

2.1.5 Sensitive Ecosystems

2.1.6 Meteorology/Climatology

2.2 Previous Removal/Remedial Actions

2.3 Source, Nature, and Extent of Contamination

- 2.4 Analytical Data
- 2.5 Streamlined Risk Evaluation
- 2.6 Ecological Risk Assessment
- 3.0 Identification of Removal Action Objectives
 - 3.1 Determination of Removal Scope
 - 3.2 Determination of Removal Schedule
 - 3.3 Identification of and Compliance with ARARs
 - 3.4 Planned Remedial Activities
- 4.0 Identification of Removal Action Objectives
- 5.0 Detailed Analysis of Alternatives
 - 5.1 Effectiveness
 - 5.1.1 Overall Protection of Public Health and the Environment
 - 5.1.2 Compliance with ARARs and other Criteria, Advisories, and Guidance
 - 5.1.3 Long-Term Effectiveness and Permanence
 - 5.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment
 - 5.1.5 Short-Term Effectiveness
 - 5.2 Implementability
 - 5.2.1 Technical Feasibility
 - 5.2.2 Administrative Feasibility
 - 5.2.3 Availability of Services and Materials
 - 5.2.4 State and Community Acceptance
 - 5.3 Cost
 - 5.3.1 Direct Capital Costs
 - 5.3.2 Indirect Capital Costs
 - 5.3.3 Long-Term Operation and Maintenance
- 6.0 Comparative Analysis of Removal Action Alternatives

7.0 FINAL EE/CA REPORT

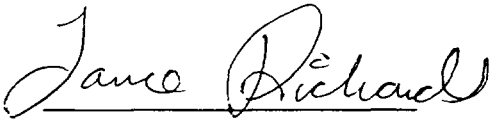
At the conclusion of all activities and subsequent to agency review of the draft EE/CA submittal, a Final EE/CA Report will be submitted to the USEPA and Illinois EPA that will include all information pertaining to this project.

8.0 SCHEDULE FOR EE/CA SUBMISSION

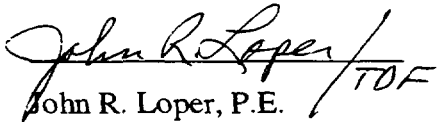
A schedule is provided in the SSP that constitutes Volume 1A of this submittal. Please refer to this schedule for information concerning all tasks involved with this project.

Engineering Evaluation/Cost Analysis Work Plan
Sauget Area 1; Sauget and Cahokia, Illinois

Respectfully submitted,
ROUX ASSOCIATES, INC.



Lance W. Richards, P.E.
Senior Engineer



John R. Loper, P.E.
Principal Engineer and Vice President

REFERENCES

OSWER, December, 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A, Interim Final. EPA/540/1-89/002 (Publication 9285.7-01B)

USEPA, October 1992. Guide for Conducting Treatability Studies Under CERCLA. Final EPA/540/R-92/071a

USEPA, August 1993. Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA. EPA 540-R-93-057

USEPA, June 1997. Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments. EPA/540/R/97/006

CFR, July 1997. National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300

USEPA, October 1997. Implementing Presumptive Remedies, A Notebook of Guidance and Resource Materials. EPA 540-R-97-029

USEPA, January, 1998. Risk Assessment Guidance for Superfund (RAGS). EPA 540/R/97/033

USEPA, January 21, 1999. Administrative Order by Consent with Respondents Monsanto Company and Solutia Inc. Sauget Area 1 Site, Sauget and Cahokia, Illinois

EE/CA and RI/FS Support Sampling Plan

Sauget Area 1

Sauget and Cahokia, Illinois

Volume 1E

Remedial Investigation/Feasibility Study Work Plan

June 25, 1999

Submitted To:

**U.S. Environmental Protection Agency
Chicago, Illinois**

Submitted By:

**Solutia Inc.
St. Louis, Missouri**

**GROUND WATER
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WORK PLAN
SAUGET AREA 1 SITE
SAUGET AND CAHOKIA, ILLINOIS**

September 8, 1999

Prepared for:

Solutia Inc.
10300 Olive Boulevard
St. Louis, Missouri 63141

Prepared by:

ROUX ASSOCIATES, INC.
1322 Space Park Drive, Suite A270
Houston, Texas 77058
(281) 335-4000

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

CONTENTS

1.0	INTRODUCTION-----	1
1.1	Objectives -----	2
1.2	Organization of Work plan -----	3
2.0	REMEDIAL INVESTIGATION -----	5
2.1	Support Sampling Plan-----	5
2.2	Data Report-----	7
2.3	Fate and Transport-----	7
2.4	Data Validation -----	8
2.5	Risk Assessment for Ground Water -----	8
2.6	Draft RI Report -----	11
2.7	Final RI Report -----	12
3.0	REMEDIAL ACTION OBJECTIVES -----	13
4.0	FEASIBILITY STUDY -----	15
4.1	Development of Alternatives-----	15
4.2	Screening of Alternatives -----	17
4.3	Detailed Analysis of Alternatives-----	18
4.3.1	Alternatives Array Document -----	18
4.3.2	Detailed Analysis Implementation-----	19
4.4	Draft FS Report -----	21
4.5	Final RI/FS Report -----	22
5.0	PROGRESS REPORTS -----	23
6.0	SCHEDULE-----	24
	References-----	26

1.0 INTRODUCTION

On January 21, 1999, Monsanto Company and Solutia Inc. (Respondents) entered into an Administrative Order by Consent (AOC) with Region V of the United States Environmental Protection Agency (USEPA) with regards to the matter of environmental efforts to be completed at the Sauget Area 1 Site in Sauget and Cahokia, Illinois (Site). The Site is identified as six (6) source areas near, or adjacent to, Dead Creek known as Sites I, H, G, L, M and N. Also included in the Site are six (6) segments of Dead Creek sediments (CS) identified as CS-A through CS-F.

One of the requirements of the AOC, identified in Section V, is to prepare and implement a Remedial Investigation/Feasibility Study (RI/FS) of the ground water underlying the Site. In addition, the AOC requires that an Engineering Evaluation/Cost Analysis (EE/CA) be performed simultaneously with the RI/FS to address the soil, sediments, surface water, and air at the Sauget Area 1 Site. The EE/CA will also address source area leachate where it is present at a higher elevation than the uppermost water-bearing zone. These two investigations will be performed concurrently and are two key components of an overall effort to address impacted media at the Sauget Area 1 Site. A Scope of Work (SOW) that outlines the RI/FS and the EE/CA to be performed at the Site, and divides the work into individual tasks, was included with the AOC as an attachment and is an integral part of the AOC.

The purpose of the RI is to evaluate the impact to ground water resulting from the disposal/deposition of materials in Sauget Area 1 and to assess the associated risk to human health and the environment. The FS will evaluate remedial alternatives for addressing the impact to human health and/or to the environment from affected ground water. This document presents the Work Plan for completing the RI/FS to be conducted at the Sauget Area 1 Site. The workplan to complete the EE/CA is provided in a separate document.

This RI/FS Work plan is consistent with the requirements of the AOC and the SOW. Furthermore, the USEPA document titled *Guidance on Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA/540/G-89/004) was used as a guidance

document during preparation of the workplan, as required by the AOC. This RI/FS work Plan was developed through a four-step process including:

- A detailed review of historical background information;
- Review of the AOC and attached SOW;
- Review of the above-referenced guidance document; and
- The identification of information and data needs.

At the conclusion of the RI/FS, the USEPA will be responsible for the selection of a Site remedy for ground water and will document the selection in a Record of Decision (ROD) for ground water.

1.1 Objectives

In accordance with the AOC and SOW, an EE/CA and RI/FS Support Sampling Plan (SSP) has been prepared independently of the EE/CA and RI/FS Work Plans. The SSP will involve collecting numerous samples (ground-water samples in this case) for laboratory analysis and evaluating the resulting data to characterize the Site. The objective of the EE/CA and RI/FS Support Sampling is to further determine the extent of potential impact at the Site beyond that already defined by previous Site investigations. The SSP contains a description of equipment specifications, required analyses, sample types, and sample locations and frequencies.

As stated above, this RI/FS Work Plan addresses ground water at the Sauget Area 1 Site. The primary objective of the overall RI/FS process is to gather information and provide evaluations and comparisons which are sufficient to support an informed risk management decision regarding the remedy selection for ground-water measures. More specifically, the objectives of the RI are to collect all data and information that will be gathered during the implementation of the SSP and incorporate these data into a comprehensive Data Report, evaluate the hydraulic characteristics of the uppermost aquifer via ground-water modeling (including a fate and transport model if necessary), assess risk to human health and the

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

environment, and evaluate potential technologies required to meet Site remedial action objectives.

The primary objective of the FS is to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to the USEPA for selection of an appropriate remedy. The FS involves developing a list of remedial alternatives that will potentially protect human health and the environment based on information that was collected during the RI and previous investigations. These alternatives will be evaluated against nine criteria provided in 40 CFR 300.430 which are: overall protection of human health and the environment; compliance with Applicable or Relevant and Appropriate Requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short term effectiveness; implementability; cost; State acceptance; and community acceptance. The SSP, RI and FS activities will be conducted concurrently so that data collected during the SSP can influence the development of remedial alternatives in the FS, which in turn may result in additional data needs which can be addressed in the remainder of the RI. As data are collected during the SSP, the need for additional sampling and data collection will be determined.

Additional objectives of the RI/FS are to satisfy all requirements stated in the AOC and attached Scope of Work, and appropriate guidance documents.

1.2 Organization of Work Plan

The organization of this Work Plan is as follows:

- Section 1.0 Background Information
- Section 2.0 Remedial Investigation
- Section 3.0 Remedial Action Objectives
- Section 4.0 Feasibility Study
- Section 5.0 Progress Reports
- Section 6.0 Schedule

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

Section 1.0 discusses relevant background and regulatory information pertaining to the RI/FS, project objectives, and organization of the Work plan. Section 2.0 discusses the RI and RI components such as the EE/CA and RI/FS Support Sampling Plan (SSP), data collection, data organization, and preparation of the RI report. Section 3.0 reviews the identification and documentation of remedial action objectives for the site. Section 4.0 discusses the FS and FS components such as analysis of RI data, evaluation and selection of remedial alternatives, and preparation of the draft and final FS report. Section 5.0 presents RI/FS progress report submittals. Finally, Section 6.0 discusses the project schedule.

2.0 REMEDIAL INVESTIGATION

This RI Work Plan, in conjunction with the Support Sampling Plan, provides a general explanation of the objectives of the study and the scope of work. Further, these Work Plans describe the study's purpose and goals while also serving as a valuable tool for assigning responsibilities and setting the project's schedule and cost.

2.1 Support Sampling Plan

As discussed above, a SSP has been prepared and will be conducted concurrent with the RI/FS in accordance with the AOC and SOW. The SSP was prepared by Solutia Inc. and is provided in Volume IA of this submittal. Most of the tasks included in this SSP are the initial tasks of an RI. Thus, these tasks will be referred to in this work plan and will be detailed in the Draft and Final RI Report. A summary of the ground-water related tasks to be completed in the SSP is provided below:

- Ground-Water Sampling in the Alluvial Aquifer, Bedrock (fill areas only), and Nearby Domestic Wells
- Discharge and Recharge Area Study
- Regional and Local Flow Direction and Quality Study
- Time-Series Ground-Water Sampling
- Slug Test Data Collection
- Grain Size Analyses
- Upgradient Ground-Water Data Collection

For each of the items listed above, a data gap study has been conducted to inventory current data and determine areas where additional data are needed for complete characterization. A complete description of each of the above tasks is provided in the SSP.

A background review of previous ground-water studies conducted at the Site and surrounding area was conducted during the preparation of the SSP. The results of this review are presented in Volume IA. The RI Report will incorporate this information and will include a thorough presentation of the existing ground-water data that have been developed at, and in

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

the vicinity of, the Site from previous years of environmental investigations. All available data and facts about local and regional ground-water conditions and uses specific to the Site and surrounding area will be assembled.

A brief summary of the Site location, general site physiography, hydrology, and geology was also prepared as part of the SSP. The RI Report will provide tables displaying the frequency of detection, maximum, minimum, average and 95 percent confidence interval concentrations of compounds detected in ground water underlying the Site. Local ground-water recharge and discharge areas will be identified, and regional and local ground-water flow directions and quality will be discussed. State, county, city, and village records will be searched to identify any potential ground-water usage along Dead Creek.

The background review will also update disposal practice histories using information submitted in response to USEPA 103C and 104E requests. A list of chemicals handled by generators, transporters and disposers will be compiled for each fill area. Information on manifesting processes will also be extracted from the 104E responses and included in the RI/FS Report.

The SSP identifies data gaps and describes the additional data acquisition activities necessary to characterize ground water. The primary objective of the work defined in the SSP is to further determine the extent of ground-water impact at the Site beyond that already identified by previous Site investigations. The SSP includes information pertaining to the field investigation and technical approach, monitor well installations, sampling procedures, analytical parameters, and other relevant information.

Subsequent to approval of the SSP by the USEPA, the SSP will be implemented accordingly and consistent with the SSP schedule (included in the SSP). This task is referred to as Task 2 in the SOW. All field activities will be coordinated with the USEPA's Remedial Project Manager (RPM) during implementation, and the RPM will be provided with all laboratory data. The SSP will be performed by personnel from O'Brien & Gere on behalf of the Respondents. Complete details from the SSP and information pertaining to the field

procedures, boring logs, analytical results, and subsequent findings will be incorporated into the RI Report.

2.2 Data Report

Subsequent to completion of all SSP field work and receipt of laboratory analytical results, the resulting data will be compiled into presentation format. This task is referred to as Task 3 in the SOW. According to the USEPA-approved schedule in the SSP, the Respondents will provide a report in tabular form, with corresponding figures, to the USEPA and Illinois EPA. The report will summarize the historic data review and results and findings from the SSP. The Data Report will be prepared by personnel from O'Brien & Gere on behalf of the respondents and will be included in the Final RI/FS Report.

2.3 Fate and Transport

To achieve the objectives of the RI/FS, definitive knowledge of the transport and fate of constituents in the subsurface is essential. Risk assessment and remediation of ground-water constituents require an understanding of how chemicals move through and interact with the subsurface environment. Results from the review of existing data, and from the SSP will be combined in the analyses of ground-water constituent fate and transport processes. If information on a constituent release is available, the observed extent of the constituent may be used in assessing the rate of migration and the fate of such constituent over the period between release and monitoring. Constituent fate and transport may also be estimated on the basis of site physical characteristics and source characteristics.

As appropriate, an analytical or numerical ground-water model will be used to better define the ground-water movement and trends at the Site. Models aid the data reduction process by providing the user with a structure for organizing and analyzing field data. Detailed numerical models (e.g., numerical codes) provide relatively greater accuracy and resolution because they are capable of representing spatial variations in site characteristics and irregular geometries.

Aquifer response parameters and geologic information from previous subsurface and hydrogeologic investigations will be integrated into the model to enable simulations of the uppermost water-bearing zone in static conditions and under given stresses (i.e., extraction or injection). The data obtained from these aquifer flow simulations will provide information pertaining to natural ground-water movement and ground-water reactions to stresses. This information will be used in support of the subsequent evaluations of the most effective remedial alternatives. This work will be performed by personnel from Roux Associates, Inc.

2.4 Data Validation

The ground-water laboratory results associated with RI sampling will be validated to determine the following:

- If the proper chain-of-custody was maintained;
- If proper methods were used;
- If holding times were met;
- If proper detection limits were achieved;
- If method blanks, field blanks, and/or trip blanks indicated any contamination;
- If relative percent differences (RPD) between a sample and its duplicate were within control limits;
- If surrogate recoveries were within method established control limits;
- If any matrix interference was evident; and
- If laboratory control samples (LCS), LCS duplicate recoveries and RPDs were within laboratory control limits.

The data validation will be performed in accordance with USEPA SW846 methodologies. The data validation procedures are discussed in further detail in Volume 4 of the Support Sampling Plan Submittal.

2.5 Risk Assessment For Ground Water

A human health risk assessment (HHRA) will be conducted at the Site. The HHRA will be conducted separately from the SSP and other RI activities, but will be included in the Draft

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

and Final RI Report. The HHRA will follow Task 4 Section 2.5 and Task 5 Section 2 of the SOW. The Human Health Risk Assessment Work Plan is presented in Volume 1B.

The HHRA will comply with USEPA guidance for conducting risk assessments including, but not limited to, the following:

- Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual (Parts A and D)(USEPA, 1989a and 1998a);
- USEPA Soil Screening Level: Technical Guidance Manual (USEPA, 1996a);
- Human Health Evaluation Manual Supplemental Guidance; Standard Default Exposure Factors. OSWER Directive 9285.6-03 (USEPA, 1991a);
- Exposure Factors Handbook (USEPA, 1997a); and
- Land Use in CERCLA Remedy Selection Process. OSWER Directive No. 9355.7-04 (USEPA, 1995).

The HHRA will consist of the following steps:

- Site Characterization –As described in Section 2.0 of the Risk Assessment Work Plan, the HHRA Report will discuss the Site and its environs, and present a conceptual Site model describing source areas, potential migration pathways, and potentially impacted media.
- Hazard Identification –As described in Section 3.0 of the Risk Assessment Work Plan, the HHRA Report will present a discussion of Site data, and a description of the constituents of potential concern (COPCs). Constituents of concern (COCs) will be identified as a subset of those COPCs. COCs represent compounds that may present risks in exceedance of the acceptable risk range of 1×10^{-6} to 1×10^{-4} for potential

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

carcinogens and a target Hazard Index of 1.0 for noncarcinogens (that act on the same target organ), as identified in the AOC, SOW, and by the Illinois EPA (1998).

- **Dose Response Assessment** – As described in Section 4.0 of the Risk Assessment Work Plan, the HHRA Report will present a discussion of the dose-response assessment process. The dose-response assessment evaluates the relationship between the magnitude of exposure (dose) and the carcinogenic and noncarcinogenic effects. The most current USEPA verified dose-response values will be used when available.
- **Exposure Assessment** – As described in Section 5.0 of the Risk Assessment Work Plan, the HHRA Report will present a discussion of the exposure assessment process. The purpose of the exposure assessment is to provide a quantitative estimate of the magnitude and frequency of potential exposure to COPCs. Potentially exposed individuals, and the pathways through which those individuals may be exposed to COPCs are identified based on the physical characteristics of the Site, as well as the current and reasonably foreseeable future uses of the Site and surrounding area. The extent of a receptor's exposure is estimated by constructing exposure scenarios that describe the potential pathways of exposure to COPCs and the activities and behaviors of individuals that might lead to contact with COPCs in the environment.
- **Risk Characterization** – As described in Section 6.0 of the Risk Assessment Work Plan, the HHRA Report will present a discussion of the risk characterization process and uncertainties associated with the risk assessment process. Risk characterization combines the results of the exposure assessment and the toxicity assessment to derive Site-specific estimates of potentially carcinogenic and noncarcinogenic risks resulting from both current and reasonably foreseeable potential human exposures. Within any of the steps of the risk evaluation process described above, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. The assumptions that introduce the greatest amount of uncertainty in this risk evaluation are discussed in Section 6.0.

- Summary and Conclusions –The HHRA Report will present a summary of the results of the HHRA.

2.6 Draft RI Report

A Draft RI report for the Sauget Area 1 will be submitted to USEPA and Illinois EPA within 90 calendar days of submittal of the Data Report (Section 2.2 of this document). This task is referred to as Task 5 in the SOW. The Draft RI Report will be prepared by Roux Associates, Inc. and will summarize data collected during the SSP implementation and provide supplemental information gathered from past investigations. The RI Report will accurately describe the vertical and horizontal extent of ground-water impact and the concentrations of the constituents present. Data obtained during the fate and transport study and Human Health Risk Assessment will also be incorporated into the report. The Draft RI Report will have the following format:

- Site Background and Description
- Past Disposal Practices
- Site Characteristics
 - Geology
 - Hydrogeology
 - ◆ Local and Regional Ground-Water flow
 - ◆ Recharge and Discharge Areas
 - Hydrology
 - Meteorology/Climatology
 - Demographics and Land Use
 - Current and Past Ground-Water Usage in the Site Area.
- Summary Information on Investigations
 - Field Investigation and Technical Approach
 - Monitor Well Installation
 - Ground-Water Sampling
 - Chemical Analysis & Analytical Methods

- ▶ Hydrogeological Assessment
- Nature and Extent of Contamination
 - ▶ Contaminant Sources
 - ▶ Ground-Water Contaminant Distribution and Trends
- Fate and Transport
 - ▶ Contaminant Characteristics
 - ▶ Ground-Water Fate and Transport Processes
 - ▶ Ground-Water Contaminant Migration Trends
 - ▶ Ground-Water Modeling
- Risk Assessment
- Summary and Conclusions

2.7 Final RI Report

Subsequent to the approval of the USEPA, a final RI Report will be prepared. This document will not be submitted as an individual document, but will be submitted along with the Final FS Report to produce the combined Final RI/FS Report.

3.0 REMEDIAL ACTION OBJECTIVES

Based on all of the information generated through this study, the evaluation of potential human health risks, and consideration of preliminary remediation goals, a list of site-specific remedial action objectives for ground water will be developed that will be protective of human health and the environment. These objectives will specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and an acceptable contaminant level or range of levels for each exposure route.

Initially, preliminary remediation goals are developed based on readily available information, such as chemical specific Applicable or Relevant and Appropriate Requirements (ARARs), or other reliable information. Preliminary remediation goals will be modified, as necessary, as more information becomes available during the RI/FS. Final remediation goals will be determined when the remedy is selected. Remediation goals will establish acceptable exposure levels that are protective of human health and the environment and will be developed by considering the following:

- ARARs under federal environmental or State environmental or facility siting laws, if available, and the following factors:
 - ▶ For systemic toxicants, acceptable exposure levels will represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety;
 - ▶ For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 1×10^{-6} and 1×10^{-4} using information on the relationship between dose and response.
 - ▶ Factors related to technical limitations such as detection/quantification limits for contaminants;

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

- ▶ Factors related to uncertainty; and
 - ▶ Other pertinent information.
-
- Maximum Contaminant Level Goals (MCLGs), established under the Safe Drinking Water Act, that are set at levels above zero, will be attained by remedial actions for ground or surface waters that are current or potential sources of drinking water, where the MCLGs are relevant and appropriate under the circumstances of the release based on the NCP factors established in §300.400(g)(2). If an MCLG is determined not to be relevant and appropriate, the corresponding maximum contaminant level (MCL) will be attained where relevant and appropriate to the circumstances of the release.
 - Where the MCLG for a contaminant has been set at a level of zero, the MCL promulgated for that contaminant under the Safe Drinking Water Act will be attained by remedial actions for ground or surface waters that are current or potential sources of drinking water, where the MCL is relevant and appropriate under the circumstances of the release based on the factors in §300.400(g)(2).
 - Water quality criteria established under sections 303 or 304 of the Clean Water Act will be attained where relevant and appropriate under the circumstances of the release.
 - An alternate concentration limit (ACL) may be established in accordance with CERCLA section 121(d)(2)(B)(ii).

4.0 FEASIBILITY STUDY

A Feasibility Study (FS) is typically conducted in three phases: development of alternatives, screening of alternatives, and the detailed analysis of alternatives. However, the specific point at which the first phase ends and the second begins is not distinct. Therefore, the development and screening of alternatives will be performed concurrently, if deemed necessary and appropriate. The NCP provides considerable latitude regarding the scope of this screening and development phase. As stated in the NCP §300.430(a)(1)(ii)(C): "Site-specific data needs, the evaluation of alternatives, and the documentation of the selected remedy should reflect the scope and complexity of the site problems being addressed." The NCP preamble emphasizes the principle of streamlining, which the USEPA applies in managing the Superfund program as a whole, and in conducting individual remedial action projects. In accordance with the principle of streamlining, an alternatives screening step may not even be deemed necessary prior to detailed analysis.

4.1 Development of Alternatives

The primary objective of this phase of the FS is to develop an appropriate array of options that will be analyzed more fully in the detailed analysis phase of the FS. Appropriate options to ensure the protection of human health and the environment may involve the complete elimination or destruction of hazardous substances in ground water at the Site, the reduction of concentrations of hazardous substances to acceptable health-based risk levels, the prevention of exposure to hazardous substances via engineering or institutional controls, or some combination of the above.

Alternatives for remediation are developed by assembling combinations of technologies into alternatives that address ground water on either a site-wide basis or for an identified area. This process consists of six general steps that are presented below:

- Develop remedial action objectives specifying the constituents of interest, exposure pathways, and preliminary remediation goals that permit a range of treatment and containment alternatives to be developed. The preliminary remediation goals are

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

developed on the basis of chemical-specific ARARs, when available, other available information and site-specific risk-related factors (see Section 3.0).

- Develop general response actions for ground water defining containment, treatment, pumping, or other actions, singly or in combination, that may be taken to satisfy the remedial action objective for the Site.
- Identify areas to which general response actions might be applied, taking into account the requirements for protectiveness as identified in the remedial action objectives and the chemical and physical characterization of the Site.
- Identify and screen the technologies applicable to each general response action to eliminate those that cannot be implemented technically at the Site. The general response actions are further defined to specify remedial technology types (e.g., the general response action of treatment can be further defined to include chemical or biological technology types.)
- Identify and evaluate technology process options to select a representative process for each technology type retained for consideration. Although specific processes are selected for alternative development and evaluation, these processes are intended to represent the broader range of process options within a general technology type.
- Assemble the selected representative technologies into alternatives representing a range of treatment and containment combinations, as appropriate.

For those situations in which numerous remediation options are appropriate and developed, the assembled alternatives may need to be refined and screened to reduce the number of alternatives that will be analyzed in detail. This screening aids in streamlining the Feasibility Study process while ensuring that the most promising alternatives are being considered.

4.2 Screening of Alternatives

The purpose of the screening evaluation is to reduce the number of alternatives that will undergo a more thorough and extensive analysis. Thus, defined alternatives are evaluated more generally in this phase than during the detailed analysis; however, evaluations will be sufficiently detailed to the extent that the alternatives can be distinguished. The screening evaluation involves evaluating the defined alternatives against the short-term and long-term aspects of three broad criteria: effectiveness, implementability, and cost. During the detailed analysis, the alternatives will be screened against nine specific criteria and their individual factors rather than the three general criteria used in screening. Thus, a significant time savings can be realized in cases where numerous alternatives are identified if the screening process is carefully implemented. The three screening criteria are briefly discussed below:

- **Effectiveness Evaluation** – A key aspect of the screening evaluation is the effectiveness of each alternative in protecting human health and the environment. Each alternative will be evaluated as to its effectiveness in providing protection and the reductions in toxicity, mobility or volume that it will achieve. Both short- and long- term components of effectiveness will be evaluated; short-term referring to the construction and implementation period, and long-term referring to the period after the remedial action is complete.
- **Implementability Evaluation** – Implementability, as a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative, is used during screening to evaluate the combinations of process options with respect to conditions at the Site. Technical feasibility refers to the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete; it also includes operation, maintenance, replacement, and monitoring of technical components of an alternative, if required, into the future after the remedial action is complete. Administrative feasibility refers to the ability to obtain approvals from other offices and agencies, the availability of treatment, storage, and disposal services and capacity, and the requirements for, and availability of, specific equipment and technical specialists.

- **Cost Evaluation** - The focus of this evaluation will be to make comparative estimates for alternatives with relative accuracy so that cost decisions among alternatives will be sustained as the accuracy of cost estimates improves beyond the screening process. The procedure used to develop cost estimates for alternative screening are similar to those used for the detailed analysis; the only differences are in the degree of alternative refinement and in the degree to which components are developed. Cost estimates for screening alternatives typically will be based on a variety of cost-estimating data. Bases for screening cost estimates may include cost curves, generic unit costs, vendor information, conventional cost-estimating guides, and prior similar estimates as modified by Site-specific information.

Alternatives with the most favorable composite evaluation of all factors will be retained for further consideration during the detailed analysis. Alternatives selected for further evaluation will, where practical, preserve the range of treatment and containment technologies initially developed. It is not a requirement that the entire range of alternatives originally developed be preserved if all alternatives in a portion of the range do not represent distinct viable options.

4.3 Detailed Analysis of Alternatives

4.3.1 Alternatives Array Document

Prior to proceeding with the detailed analysis of alternatives, an Alternatives Array Document will be prepared. This document will summarize the Remedial Action Objectives that were previously determined and list each of the initially selected technologies and provide the basis for selection. Furthermore, the document will provide details of the Alternative Screening Evaluation including the results of the study in a tabularized form. Finally, the document will propose a list of remedial alternatives for inclusion in the Detailed Analysis of Alternatives Study. This document will be included in the RI/FS Report.

The Alternatives Array Document will also summarize, in table format, the pertinent ARARs. These tables will be developed in accordance with USEPA guidance and existing State laws. The USEPA defines three types of ARARs:

- Chemical-specific
- Location-specific
- Action-specific

Chemical-specific ARARs include those laws and requirements that regulate the release of materials having certain chemical or physical characteristics, or materials containing specified chemical compounds, to the environment. These requirements generally establish health- or risk-based concentration limits or discharge limitations for specific hazardous substances. Maximum Contaminant Levels promulgated under the Safe Drinking Water Act, and the analogous Illinois Groundwater Quality Standards are important ARARs for this Site.

Location-specific ARARs are those requirements that relate to the geographical or physical position of the site, rather than to the nature of the contaminants or the proposed site remedial actions. These ARARs typically deal with environmentally sensitive areas (e.g., wetlands, flood plains, fault zones, etc.), and may limit the remedial actions that can be implemented, or may impose additional constraints on the remedial action.

Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances. These ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. These requirements are triggered by the particular remedial activities that are selected to achieve remedial action objectives.

4.3.2 Detailed Analysis Implementation

The Detailed Analysis will include: 1) a technical description of each alternative that outlines the strategy involved and identifies the key ARARs associated with each alternative; and 2) a discussion that profiles the performance of that alternative with respect to each of the nine evaluation criteria. This evaluation will include a table summarizing the results of this analysis. The nine evaluation criteria for Detailed Alternative Analysis are as follow:

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

Overall Protection Of Human Health and the Environment addresses whether or not the remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs addresses whether or not the remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes and/or provide grounds for invoking a waiver. A separate table will be included in the FS that details all Federal and State ARARs for ground water.

Long-Term Effectiveness and Permanence refers to the ability of the remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies a remedy may employ.

Short-Term Effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Implementability is the technical and administrative feasibility of the remedy, including the availability of materials and services needed to implement a particular option.

Cost includes estimated capital and operation and maintenance costs, and net present worth costs.

State Acceptance The USEPA will consider and address Illinois EPA acceptance of an alternative when making a recommendation and in the final selection of a remedy in the ROD.

Community Acceptance The USEPA will consider and address community acceptance of an alternative when making a recommendation and in the final selection of a remedy in the ROD.

The criteria listed above will be used to effectively compare each of the technologies. These criteria are categorized into three groups listed below:

- **Threshold criteria.** Overall protection of human health and the environment and compliance with ARARs (unless a specific ARAR is waived) are threshold requirements that each alternative must meet in order to be eligible for selection.
- **Primary balancing criteria.** The five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.
- **Modifying criteria.** State and community acceptance are modifying criteria that the USEPA will consider in remedy selection. Section 121 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides for state involvement in remedy selection, while Sections 113 and 117 provide for public participation during remedy selection. These two criteria are applied to the remedy selection process following receipt of comments on the FS (for support agency acceptance) and after the public comment period following publication of a Proposed Remedial Action Plan. Therefore, these modifying criteria will not be addressed specifically in the FS.

4.4 Draft FS Report

At the conclusion of the activities described previously, a Draft FS Report will be prepared and submitted to the USEPA and Illinois EPA. This document will list the selected Remedial Action Objectives, include all details pertaining to the selection of remedial alternatives, preliminary evaluation and screening of alternatives, and detailed evaluation and selection of alternatives. Furthermore, recommendations for the final selected remedial alternative will

be included in the Draft RI/FS document. Correspondence from the regulatory agencies will be provided in the Appendices to the FS Report.

4.5 Final RI/FS Report

At the conclusion of all activities and subsequent to agency review of the draft RI and FS submittals, a Final RI/FS Report will be submitted to the USEPA and Illinois EPA that will include all information pertaining to this project.

5.0 PROGRESS REPORTS

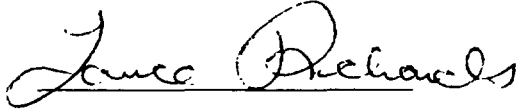
Written progress reports will be submitted to the USEPA and Illinois EPA concerning activities undertaken pursuant to the AOC and SOW, beginning 30 calendar days subsequent to the effective date of the AOC. These reports will continue until termination of the Order, or unless otherwise specified in writing directly from the RPM. These reports will describe significant developments during the preceding reporting period, including the work performed and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period.

6.0 SCHEDULE

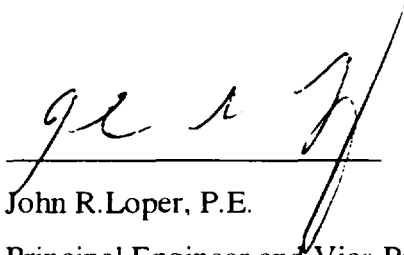
A schedule is provided in the SSP (Volume 1A of this submittal).

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

Respectfully submitted,
ROUX ASSOCIATES, INC.



Lance W. Richards, P.E.
Senior Engineer



John R. Loper, P.E.
Principal Engineer and Vice President

REFERENCES

USEPA, October 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. EPA/540/G-89/004

USEPA, 1989a and 1998a, Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual (Parts A and D);

USEPA, 1991a, Human Health Evaluation Manual Supplemental Guidance; Standard Default Exposure Factors. OSWER Directive 9285.6-03

USEPA, 1992a. Evaluation of Ground-Water Extraction Remedies: Phase II, Volume II 1-Summary Report. Office of Emergency and Remedial Response, Washington, D.C. USEPA Publication 9355.4-05.

USEPA, 1992b. Evaluation of Ground-Water Extraction Remedies: Phase II, Volume 2 – Case Studies and Updates. Office of Emergency and Remedial Response, Washington, D.C. USEPA Publication 9355.4-05A.

USDOE, December 1993. Environmental Guidance – Remedial Investigation/Feasibility Study (RI/FS) Process, Elements and Techniques Guidance

USEPA, 1995, Land Use in CERCLA Remedy Selection Process. OSWER Directive No. 9355.7-04

USEPA, 1996a, Soil Screening Level: Technical Guidance Manual

USEPA, 1997a, Exposure Factors Handbook

CFR, July 1997. National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300

Remedial Investigation/Feasibility Study Work Plan
Sauget Area 1 Ground Water; Sauget and Cahokia, Illinois

USEPA, October 1997. Implementing Presumptive Remedies, A Notebook of Guidance and Resource Materials. EPA 540-R-97-029

USEPA, January 21, 1999. Administrative Order by Consent with Respondents Monsanto Company and Solutia Inc. Sauget Area 1 Site, Sauget and Cahokia, Illinois